

Diagnosis of Hemorrhagic Diseases

Evaluation of Procedures

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PART II

Preoperative Tests

ROUTINE PREOPERATIVE TESTS to predict hemorrhage in patients would be indicated if there were simple and reliable tests which would reveal abnormality of hemostatic mechanisms with reasonable accuracy. Routine tests for hemorrhagic disease would be indicated if there were a surplus of trained technologists and unlimited funds available. Unfortunately, there are no simple or complicated tests that are infallible in predicting the tendency to bleed. There is a shortage of technologists and cost must be considered.

In the opinion of the author, extensive and careful hemorrhagic studies should be made on patients whose history, physical examination and screening laboratory tests indicate the need for such tests, but these studies should not be performed routinely on every patient scheduled for surgical operation. Routine hemorrhagic tests are not specified by national surgical and hospital agencies which set the requirements for procedures in approved hospitals. A surgeon would not be considered negligent if he did not perform routine preoperative tests for bleeding time and blood coagulation.

Staff and hospital rulings which require routine preoperative tests for hemorrhagic disease force the laboratory to adopt time-saving and inferior methods. The bleeding time is usually determined from a puncture wound of the thick, elastic and self-closing skin of the finger tip. The clotting time is one of the micromethods which utilize a few drops of blood well mixed with thromboplastin from the same skin puncture wound. These two procedures can usually be performed within five minutes and, if necessary, while the patient is being wheeled to the operating room or is being draped for operation. More accurate methods such as the Ivy bleeding time method or the multiple tube coagulation time method would require 30 to 45 minutes of the technologists' time. Observation of the clot, which should be part of any hemorrhagic study, would require additional time.

• Routine preoperative tests such as the determination of bleeding time and coagulation time are unnecessary and are not recommended. Rulings which require routine preoperative tests result in the adoption of inferior and unreliable time-saving methods in the laboratory. If the clinical staff insists that laboratory procedures to predict hemorrhage be performed on every patient scheduled for operation, approved methods of performing the tests should be employed.

Preoperative procedures should include a personal and a family history, a careful and complete physical examination and screening laboratory tests such as urinalysis, hematocrit, leukocyte count and smear examination, including estimation of the number of thrombocytes.

Special hemorrhagic studies are indicated on selected patients. These selected patients include those who have a history of abnormal bleeding, those who consider themselves "easy bleeders" or who have apprehension concerning hemorrhage at the time of operation, and those who have physical signs of hemorrhage. Special hemorrhagic studies should also be performed on patients who have diseases that are known to be associated with vascular and coagulation abnormalities, infants who have not been subjected to tests of trauma and on patients from whom a reliable history cannot be obtained.

Extra precaution should be taken if operation is to be performed in hospitals or clinics that do not have adequate blood banking facilities and if the operation is to be performed in one in which difficulty in hemostasis is anticipated.

The preoperative tests that are indicated on selected patients should include as a minimum: The thrombocyte count, determination of the bleeding time by the Ivy method, determination of the coagulation time by the multiple tube method and the observation of the clot. Where facilities are available, the hemorrhagic study should also include the plasma and serum prothrombin activity tests.

The pathologist is aware or should be aware that the tests performed are not acceptable from a scientific standpoint; but he does not insist on making a change, for he does not have the technical staff required to perform the tests in an approved manner. He often does not have the missionary zeal that is required to change a traditional hospital custom and does not have the fortitude to buck the edicts of a dictatorial and omnipotent clinical staff. The hospital administration is not interested in losing a source of steady revenue. The surgeon heartily approves, for he believes that reliable methods are being used and

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that his patient will not bleed abnormally since the laboratory results are normal. Everyone benefits except the patient who is not protected, but who pays for a service he does not receive.

In the past, the performance of the finger-tip bleeding time and the capillary tube clotting time was an accepted and standard practice and afforded the surgeon, the laboratory director and the hospital administration a degree of medicolegal protection which comes from the performance of the usual and customary procedures. Such procedures will not, in the light of present knowledge, continue to be accepted.

The acceptable practice at present should be to obtain a personal and family history from the patient and to ask him specific questions about abnormal bleeding following trauma, about spontaneous bleeding from mucous surfaces, and about ease of bruising. The surgeon or his assistants should also be expected to examine the patient before the operation and to order the usual screening laboratory procedures, such as the hematocrit, the white cell count, the blood smear examination and urinalysis. The examination of the blood smear should not be limited to the differential count of the leukocytes, but should include an appraisal of the erythrocytes and an enumeration of the thrombocytes in terms of number per oil immersion field. If the technologist is instructed to report any abnormality of bleeding following skin or venipuncture, the patient will receive the same so-called determination of "bleeding time" he now receives, without a special order or an extra charge.

If the physician desires to shift the responsibility for the detection of hemorrhagic disease to the laboratory and if he expects the examination to be performed in five or ten minutes, the technologist should be given a check list of questions to ask the patient and should examine the skin and the mucous membranes. The history and superficial examination performed by a technologist would be more likely to reveal a tendency to bleed at the time of operation than would the performance of laboratory tests, such as making a few passes at the patient's finger tip with a wisp of cotton and pantomiming the clotting time by a few gestures with little glass tubes. Such token tests belong in the class of voodoo and witchcraft and should no longer be tolerated in the age of thromboplastin precursors and accelerator factors.

There is no contraindication to the performance of routine preoperative tests if the surgeon, the hospital administration or the patient desires such procedures. The contraindication is the use of methods which are not acceptable. If the hospital, clinical staff or laboratory directors insist on routine preoperative tests by approved methods, additional technologists must be employed, an extra hospital day for preoperative tests must be allowed and a

significant increase in the charge for the procedure must be considered.

It has been the author's experience that the difficulty in hemostasis at the time of operation does not occur because the surgeon does not order routine hemorrhagic tests, but because he does not obtain an adequate history, because his physical examination of the patient is incomplete and because the screening laboratory tests were inaccurately performed or the results of the tests disregarded. One fatality due to hemorrhage following tonsillectomy and adenoidectomy occurred in a child with leukemia who had enlarged tonsils and palpable cervical nodes. The bleeding time and coagulation time by the methods employed were normal. The generalized lymph node enlargement and slight splenic enlargement were not detected. No attention was given to slight leukopenia and an abnormal differential count.

Another death due to hemorrhage occurred in a woman admitted to the gynecological service because of uterine bleeding. Preliminary studies revealed anemia and leukocytosis. The examination of the blood smear did not include the enumeration of thrombocytes. Following dilation and curettage, uterine bleeding was excessive. Multiple transfusions were ineffective. Hysterectomy was performed. The patient bled to death postoperatively. The diagnosis was thrombocytopenic purpura. On re-evaluation of the case and on re-examination of the blood smears, it was obvious that the catastrophe could have been prevented if a more careful history had been obtained, if attention had been given to the few petechiae on the skin and if the technologist had examined the smear properly and had reported the thrombocyte deficiency. In this patient there was a clear indication, not for a routine finger-stick bleeding time and capillary coagulation time, but for a special hemorrhagic study, for the patient was admitted to the hospital because of abnormal bleeding.

Routine preoperative tests cannot possibly predict bleeding which develops as a result of the sensitivity to drugs or to injections given at the time of or following operation. No tests have been devised which can anticipate the development of fibrinogenopenia and fibrinolysis at the time of operation. Most of the troublesome hemorrhagic complications develop several days or weeks after the operation. Preoperative hemorrhagic tests reveal the reaction of the patient or his plasma under preoperative conditions and cannot possibly anticipate phenomena that may develop at a later date as a result of new etiologic agents.

Routine preoperative tests performed by the most acceptable methods and by the most skilled technologists will not detect hemorrhagic disease in all patients with hemorrhagic disease. In vascular diseases such as hereditary hemorrhagic purpura (pseudohemophilia), purpura due to allergy, thrombas-

thenia and the milder forms of classical hemophilia or deficiency of plasma thromboplastin component and plasma thromboplastin accelerator, the bleeding time and the coagulation time may be within the range of normal variation. In patients with these conditions, the diagnosis is made by the history and the special and more sensitive tests, and not by routine tests, which are usually erroneous because they give results of a false negative type.

SELECTION OF PATIENTS FOR SPECIAL PREOPERATIVE TESTS

Although it is not recommended that preoperative tests for hemorrhagic disease be performed routinely, it is recommended that more complete tests be performed by experts on selected patients who are scheduled for surgical operation.

If patients are admitted with severe hemorrhage from any site, and particularly if they are bleeding from multiple sites, the basic tests for vascular and plasma deficiency components should be performed at the time the blood is taken for typing and cross-matching. If technologists are not available at the time, the physician should personally observe the clotting time of the blood, the character of the clot and the ease of bleeding following skin puncture. He should personally see that smears are made to appraise thrombocytes and to rule out primary blood dyscrasias such as leukemia and aplastic anemia. After transfusions have been given, the blood to be tested is no longer the patient's blood, but a mixture of the patient's blood and the citrated blood of a normal donor.

If the patient is admitted to the obstetrical service because of uterine bleeding, it is imperative that the clotting time be determined immediately and that the clot be saved for observation of its character and lysis. If the clotting time is short or normal, if the clot is firm, and if it retracts and holds the major portion of the erythrocytes within the fibrin mass, fibrinogenopenia can be excluded. If the blood clots slowly and if the clot is friable and tends to liquefy or if the fibrin web on retraction fails to hold the red cells in its meshes, the diagnosis is fibrinogenopenia and fibrinolysis (see Figure 1). In case of doubt, fibrinogen or fresh plasma and/or whole blood should be given immediately. By saving the first blood clot and by performing serial coagulation studies, saving each clot in turn for observation and comparison, the treatment of the patient and his response to therapy can be evaluated.

Preoperative hemorrhagic tests should be performed on all patients who have a personal or family history of abnormal bleeding, on all patients who have physical signs of hemorrhage and on all who have systemic diseases which are known to be commonly associated with hemorrhagic tendencies (leukemia, nephritis, cirrhosis or lupus erythemato-

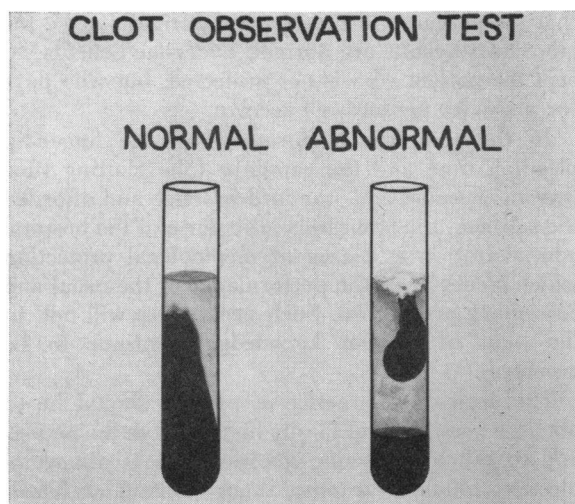


Figure 1.—Character of a normal clot compared with a defective clot from a patient with fibrinogenopenia. (Modification of an illustration that appeared in "Hemorrhagic States During Pregnancy" by O. D. Ratnoff, J. A. Pritchard, and J. E. Colopy in the *New England Journal of Medicine*, 253:63-69, 97-102, July 14 and 21, 1955.

sis). A battery of studies for the detection of hemorrhagic abnormality should be performed on all patients who think that they are "easy bleeders." Apprehension on the part of the parents of a patient is sufficient indication for the performance of screening tests, provided that the tests performed are acceptable tests such as the Ivy bleeding time test, the multiple tube coagulation time test, the observation of the clot and the evaluation of the thrombocytes.

The preoperative precautions taken depend somewhat upon the nature of the operation contemplated, the qualifications of the surgeon and the facilities available at a given hospital for emergency transfusion. Patients scheduled for pulmonary and cardiovascular operations should have special studies performed preoperatively. Hereditary defects in the blood coagulation components are more common in patients with congenital heart lesions than in normal persons. One would be more hesitant to risk abnormal bleeding in a small rural hospital without a blood bank than in a large general hospital with adequate transfusion facilities.

Tests for hemorrhagic disease are indicated on patients scheduled for operative procedures, who are not able to give a reliable history. Circumcision and other operations on infants should be preceded by screening tests for abnormalities in bleeding and in coagulation. Here it is indicated and justified to determine the coagulation time by an admittedly inferior micromethod, since puncture of superficial veins in infants is difficult and often impossible. Aspiration of blood from the femoral or jugular veins is contraindicated, for deep vein puncture in patients with hemophilia or other severe hereditary

Figure 2.—Sample of sheet for reporting and interpreting results of special hemorrhagic tests in selected cases

Name of Patient _____ Date _____
 _____ Age _____ Sex _____ Referred by _____

HEMORRHAGIC STUDY

	Patient	Normal
Bleeding time (Ivy method):		
Free flow.....	_____	1 to 6 minutes
Oozing of blood-tinged fluid.....	_____	1 to 4 minutes
Capillary fragility (tourniquet test).....	_____	No petechiae
Clotting time (4 tube method):		
Tube 2:_____ 3:_____ 4:_____ Average:	_____	Less than 25 minutes
Observation of the clot:		
Volume of serum expressed.....	_____	40 to 60 per cent
Volume of clot.....	_____	
Packed cell volume (per cent).....	_____	
Fluid volume of the clot (per cent).....	_____	0 to 20 per cent
Description:		
Thrombocyte Count (No. per 100 oil immersion fields).....	_____	500 or more
Plasma prothrombin activity (Quick's method).....	_____sec.	_____sec.
Serum prothrombin activity.....	_____sec.	_____sec.
Other tests:		

Interpretation:

Examined by _____

hemorrhagic anomalies may be followed by massive extravasation of blood. In the taking of blood for determination of coagulation time by one of the micromethods, the heel or toe should be punctured with a surgical blade and freely flowing blood obtained in order to avoid admixture with tissue thromboplastin. A deeper wound and rupture of larger vessels is also indicated to test the effectiveness of the vascular mechanisms. Recurrence of bleeding after cessation, or the necessity of applying a pressure bandage to staunch the flow of blood, is a warning against elective surgical procedures. The surgeon on operating on infants and on patients on whom an adequate history has not been obtained should, after making the first incision, pause a few minutes to see whether or not there is adequate hemostasis at the time of incision, without hemostats or ties, before going into the deeper tissues.

If there is excessive bleeding from an operative wound, specimens of this blood which are so readily and copiously available should be placed in a test tube or medicine glass and examined. The clotting time of such blood and the character of the clot will be of immediate value in making a decision as to whether to cut or to sew, to proceed or to "back out."

SELECTION AND PERFORMANCE OF TESTS

In patients scheduled for operation on whom special hemorrhagic studies are indicated, the minimal procedures should include the blood smear examination, including an estimate of the number of thrombocytes per 100 oil immersion fields, determination of the bleeding time by the Ivy method, the tourniquet test, determination of the clotting time by the multiple test tube method and the observation of the clot. Other tests which are recommended in patients who have a history and signs of hemorrhagic disease, or who have diseases known to be associated with hemorrhagic tendencies, are the plasma and serum prothrombin activity tests (Figure 2). The performance of the battery of hemorrhagic tests should be scheduled at a time that is convenient to the technical staff and should not be ordered or considered as a part of the daily routine. The results of these special tests should be reported on a special sheet (see Figure 2) and the findings interpreted by a physician who is familiar with the methods used, the normal values of the methods and the significance of the combined tests.

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